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# Does Sight Vocabulary Enhance L2 Reading Comprehension?

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## Sight vocabulary and levels of discourse comprehension

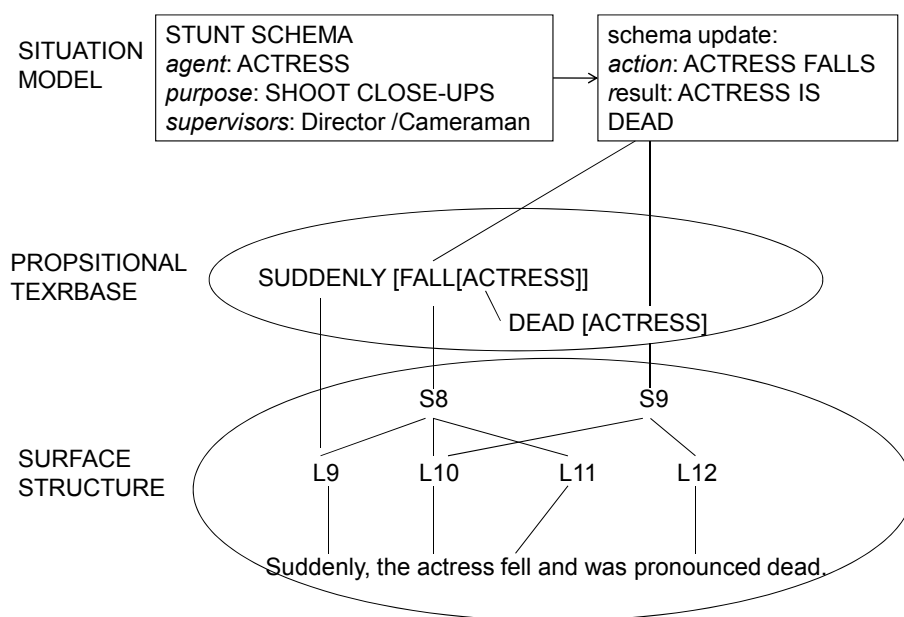
There are supposed to be a variety of ways for Japanese native speakers to memorize English words in order to improve their English reading ability. In junior or senior high school, for instance, some students try to memorize English words by writing them repeatedly, or some repeat them orally, or the others just listen to audio English materials. A variety of studies have been conducted on how well teachers can support students to memorize English words. As an example of this, a lot of researchers have examined the effectiveness of a way called keyword method; students memorize second language words using imagery or equivoque (e.g., Delaney, 1978; Pressley, Levin, Nakamura, Hope, Bispo, & Toye, 1980; Pressley, Levin, Hall, Miller, & Barry, 1980; Pressley, Levin, & Miller, 1981, Pressley, Levin & McCormick, 1980). In accordance with methods for learning second language vocabulary, their mental representations are supposed to differ from each other. If one student tries to memorize words by writing them, their mental representation will suit the student's writing ability, but it might not necessarily effect for his or her listening ability. If a student hopes to improve his or her English reading ability, for example, his or her mental representation of English words must be suitable for reading.

With regard to a person's reading activity, there are supposed to be at least two different levels of mental representations in the field of cognitive psychology (Kintsch, 1988). One level of mental representation is *propositional textbase* (van Dijk & Kintsch, 1983), which can be almost the same as the meaning of the discourse itself. This textbase representation is constructed by the information that is directly expressed in the text, organized and structured as the author had written the text (van Dijk & Kintsch, 1983). The other level of mental representation is called *situation model* (van Dijk & Kintsch, 1983). By combining the

information constructed in the level of *propositional textbase* with reader's prior knowledge, they can achieve text comprehension at the *situation model* level (Kintsch, 1994). The construction of the mental representation called *situation model* often involves reorganizing the information according to their background knowledge, because readers grasp knowledge as a whole rather than the particular text that they have just read (van Dijk & Kintsch, 1983). As for the depth of discourse comprehension, if readers comprehend the text at the level of *textbase*, this does not necessarily mean that they can understand it at a deeper level (McNamara, Kintsch, Songer, & Kintsch, 1996). From this argument, it can be safely said that the final aim of language instruction, especially for improving reading abilities, should be to enhance students' ability to construct *situation model* from texts written in their foreign or second languages.

Regarding the *propositional textbase*, more precisely, when the first relevant word concerning a particular concept is found and processed, the word needs to be stored in the working memory before the search for the next relevant element, a word or words, can continue. This repetition of finding and processing words must be continued in the working memory of a reader until the last word is found and processed. Readers interconnect nodes at each level, and also links naturally occur between each level in order that a sentence in the surface structure is connected to the corresponding proposition in the *propositional textbase*. The information constructed at the level of *propositional textbase* is linked to the appropriate schemata at the *situation model* level in turn (Glenberg, Meyer, & Lindem, 1987). With regard to this linkage between each level of mental representation, Schmalhofer, McDaniel, and Keefe (2002) illustrate their model using an example that is reproduced in Figure 1. The text described in Figure 1 is a story about a movie stunt, which results in a critical accident. Readers are supposed to comprehend the text by connecting the units at the surface level not only to each other but also to propositional units at the *propositional textbase* level. The propositions of the textbase are linked, in turn, to the *situation model* units, which are here represented as schema.

FIGURE 1  
Surface Structure, Textbase, and Situation Model



Adapted from Schmalhofer, McDananiel, & Keefe (2002).

In order to construct a *propositional textbase*, readers first access words, and then the grammatically cued information and the emerging meaning must all be active for a short period of time in working memory (Berquist, 1997). In working memory information can be kept active for one to two seconds while it carries out the appropriate processes, so if each piece of information is to be integrated in order that an accurate sense of meaning is formed, the information must be combined rapidly (Harrington & Sawyer, 1992). Speed of processing is critical at this level of mental representation (Kintsch, 1998). The speed of processing words is not simply an additional factor of comprehension abilities for a second language (Alderson, 2000; Grabe, 1999; Grabe & Stoller, 2002). If processing of active information cannot be executed quickly enough, the information will be deleted from working memory. In that case, the information must be reactivated again, which leads to taking more resources in working memory, which will make the reading process more inefficient (Sarig, 1993).

In order for Japanese students of English language as a foreign

language to better construct a *textbase* as well as a *situation model*, teachers should encourage them to construct a mental representation of English vocabulary that is more suitable for quick and appropriate linkage among the words used in a text. From this argument, in more concrete terms, what kinds of instruction would be thought to be better to achieve this aim? One method might be the form called sight vocabulary, which is a concept originally used to describe the development of children's reading ability.

Sight vocabulary or sight words can be defined as the ones that children are able to recognize on sight when they read passages or texts, and that they don't need to decode using phonic or other reading skills (Richards & Schmidt, 2002). According to this definition, one way to support Japanese students of English language in acquiring better reading skills would be to instruct them to memorize English words with a time constraint.

As for the time restriction, several experiments for this lexical decision in readers' mother language have been conducted (e.g., Shank & Abelson, 1977; Swinney, 1979). Till, Mross, and Kintsch (1988) have reported from their experiment that 350 milliseconds per a word is one threshold to determine whether good discourse comprehension could occur or not. Considering that these results were brought about from their experiment to investigate readers' native language and not their foreign or second languages, we have decided from the gained results of our pilot study that the time restriction to memorize one word should be 2000 millisecond.

From the argument discussed above, it can be arguably hypothesized that the use of sight vocabulary helps Japanese students of English language to read a text written in English to construct good *propositional textbase* as well as *situation model* better than the vocabulary whose mental representation cannot provide the readers with instant interconnected nodes.

### Purpose

This study aims, firstly, to examine whether or not Japanese students of English as their foreign language to acquire sight vocabulary through the instruction CD program that has been developed for this study. Secondly, this study intends to investigate whether or not the English sight vocabulary can help students to construct better *textbase* as well as *situation model* on the condition that they acquire sight vocabulary through our CD program, by directly manipulating the manner in which students memorize English words. More specifically, using an explanatory

text written in English, this present study compares the performance regarding text comprehension among the following two groups. The first group is instructed to memorize English words through our instruction CD program that require them to memorize English words with time restriction —2000 millisecond in this study— (experimental group). The second is also instructed to memorize the English words as the first group is asked to memorize, but they are not provided our instruction CDs and thus without any time constraint per word (control group).

### Hypothesis

Our instructional CDs require students to memorize English words within a limited time. Accordingly, it is hypothesized that if our instruction CDs, which are aimed to aid acquisition of English sight words for the text used in this experiment, are actually effective, the students in the experimental group will outperform those in the control group in the vocabulary test, in which students in both two groups are required to choose one correct Japanese translation out of three within 2000 millisecond. In addition, when the students in the experimental group can successfully acquire sight vocabulary, it is hypothesized that the experimental group will construct better *textbase* and *situation model* for a given text than the control group, since the instant linkage among the words used in a text is critical for a better construction of both mental representations of a given discourse.

## Method

### *Design and participants*

The types of the way to memorize the words used in the text (experimental group: those who were expected to memorize the words within a limited time per a word on computer based situation versus control group: those who were asked to memorize the words on a paper based situation with no time restriction per a word) was a between-subject factor. The dependent variable was the amount of correct responses during the two different kinds of tests to measure the *propositional textbase* level of comprehension and the *situation model*. Fifty five university students (male: 25 and female: 30) participated in this study. All participants were native speakers of Japanese. Bookstore vouchers (equivalent to two thousand Japanese yen) were given to each participant. The participants

were randomly assigned to one of the two groups mentioned above: experimental group (male: 13, female: 16) and control group (male: 12, female: 14).

## *Materials*

### *Equipment*

For the vocabulary test, two hundred and eight words were produced on digital flash cards using Adobe Flash Player. An example of the display of the test program is shown in Figure 2. This program was developed for the following two reasons. Firstly, in order for the participants in the experimental group to memorize all the words in a limited time and thus for all the words to be sight words. Secondly, to measure how well the participants in both groups memorized the words used in the text. This program was timed by using computers (Dell, Inspiron 1300) and displayed on computer monitors.

### *Text*

An explanatory text was used as a material in this study. This text concerns the ecology of polar bears (446 words, 4 paragraphs, Flesh Reading Ease: 59.7, and Flesh-Kincaid Grade Level: 8.9). The whole text used as a material is shown in Appendix.

### *Comprehension tests*

In the field of cognitive psychology, especially in the field of discourse comprehension research, it is supposed that there are at least two different levels of comprehensions (Kintsch, Welsch, Schmalhofer, & Zimny, 1990). One level of text comprehension is *propositional textbase* (van Dijk & Kintsch, 1983), which refers to the meaning of the discourse itself. This *textbase* comprises information that is directly expressed in the text, organized and structured as the author had organized the text (van Dijk & Kintsch, 1983). As for the depth of comprehension, if readers comprehend the text at the level of the *textbase*, this does not necessarily mean that they can understand it at a deeper level (McNamara, Kintsch, Songer, & Kintsch, 1996). The other level of discourse comprehension is called the *situation model* (Kintsch & van Dijk, 1978). As readers integrate the information provided in the text with their prior knowledge, which often involves reorganizing the information, since readers grasp knowledge as a whole rather than the particular text that they have just read, they can achieve text comprehension at the *situation model* level (Kintsch, 1988). To summarize, the *situation model* is similar to the representation constructed by directly seeing or experiencing the situation

depicted by the text. It is empirically demonstrated that the understanding of texts at the level of the *situation model* is deeper than that at the level of the *propositional textbase* (McNamara, Kintsch, Songer, & Kintsch, 1996). In a number of previous studies employing these two levels of comprehension (e.g., Kintsch, 1988; Kintsch, 1998; van Dijk & Kintsch, 1983; Zwaan & Radvansky, 1998), sentence verification tasks have often been used to measure how well the participants understand the text at the level of the *propositional textbase*, while inference tasks have usually been conducted to measure it at the level of the *situation model*. From the argument mentioned above, we decided that both these tasks—the sentence verification and inference tasks—would be used as comprehension tests in this study.

In the sentence verification task, halves of the twenty-two sentences in the original text were partially rewritten in order that the meaning of these eleven sentences would become different from that of the original sentences. Besides, the twenty-two sentences including these eleven wrong sentences were randomized. For these twenty-two sentences, the participants were asked to judge whether or not they had seen them in the original text according to four scales (1: have never seen, 4: have absolutely seen), sentence by sentence. This sentence verification task was printed on a B4 page. Examples of wrong sentences are shown below.

*Examples of wrong sentences in the sentence verification task*

- <an original sentence> The ice may drift considerable distances each day.
- <the wrong sentence> The ice may drift short distances each day.
- <an original sentence> This behavior is energy-efficient in an environment where calories can be hard to come by.
- <the wrong sentence> This behavior is energy-inefficient in an environment where calories can be easy to come by.

In the inference task, six questions were developed, in which participants were required to draw inferences from what was written in the original text. The participants were asked to choose one out of six choices. This inference task was produced on a single A4 sheet. Examples of questions in the inference task are given below.



*Examples of the questions in the inference task*

- (1) What do you think is the best behavior for polar bears after they walk faster than 7 kilometers per hour?
- (2) If polar bears are moved to an area where the temperature is much higher than that at the North Pole and in which they can more easily hunt their prey, what do you think will happen to their body structure?

FIGURE 2

An Example of the Display of the Vocabulary Test



*Procedure*

Sessions were conducted by the first author in two periods of university class time; approximately 180 minutes for both of the groups with a mixed condition in a computer room. The sessions were timed using a stopwatch. First, according to their TOEIC-Bridge test scores in the reading section, the students were assigned to one of the two groups in such a way that each group did not significantly differ in terms of their genders and the English reading abilities of its members. Immediately before the

commencement of the vocabulary study and text reading period, all the participants were instructed that they were going to be asked to memorize two hundred and eight English words for forty minutes sufficiently enough to comprehend the provided text for fifteen minutes, and then required to answer two sorts of questions, each question type to be allocated 12 minutes. In addition to this general instruction, those who agreed with the general design of this experiment were asked to sign a letter of consent.

The participants in the experimental group were informed that they were expected to use a computer program to memorize the words. They were handed CDs and then asked to turn on their computers and launch the computer program to memorize the words. As for the control group, they were handed the list of two hundred and eight words on a B4 page, and then asked to memorize them as they usually memorize English words. It was emphasized to the both groups that they were expected to memorize the words sufficiently before reading the text so as to comprehend a text that was going to be distributed after this session. Moreover, all the participants were instructed that dictionaries could not be used while reading the text. Forty minutes were allocated for this session.

Following this, answer sheets for the sentence verification and inference tasks were distributed. The participants in both groups were handed the text shown in Appendix. Then, they were asked to start studying the material for a fifteen minute duration. At the end of the fifteen minutes allocated for reading and study, they were asked to turn the text over so that they could not refer to the text during the next session.

Immediately after the reading and study period, the inference task was conducted for a six minute duration, followed by the sentence verification task for a six-minute duration. Since the text material had been turned over, the students were unable to refer to the text during either the inference or sentence verification task.

Finally, a questionnaire survey was conducted for identifying whether or not the participants had background knowledge regarding the ecology of polar bears. This questionnaire contained two questions that were as follows: (a) Have you ever seen, heard, or watched a story similar to the content of the text you have just read? (b) Have you ever attended classes or read technical journals on ecology, behavioral science, ethology, or evolutionary theory at the university? However, it was proved that none of the participants had any background knowledge regarding these topics.

After this, all the participants were given a fifty-minute intermission. After it was ensured that all the participants were back together, they all were handed the same CDs as were used for the experimental group to memorize the two hundred and eight words, and also they were handed the paper on which they were expected to report how many words out of two hundred and eight words they correctly answered. All the participants were then requested to open the file, execute the program, and wait for the instruction to begin. Then, the participants were asked to start taking the vocabulary test for approximately twenty minutes. Right after this computer-based test, the participants were instructed to write the number of the words they correctly answered on the papers. After the papers were collected, they were given bookstore vouchers which were equivalent to two thousand Japanese yen.

### *Scoring*

The sentence verification task was scored as follows: the points of verification for each sentence (from 1 to 4) were added up, and this sum was divided by the number of sentences (22 sentences). While scoring for this task, the points for the wrong sentences—whose meanings were made to differ from those of the original ones—were reversed. That is to say, if a participant assigned one point, which means “have never seen,” to a wrong sentence, then four points were scored; on the other hand, if the participant assigned four points, which means “have absolutely seen,” to another wrong sentence, then one point was scored. The full score for the sentence verification task was four points.

The inference task was scored in accordance with predetermined keys. If a participant chose the correct answer for a question, then one point was awarded. For the inference task, the full score was six points.

## **Results**

A *t*-test was conducted on the scores of the vocabulary test, the sentence verification task, and the inference task. Table 1 shows the means and standard deviations of these three tests. All statistical tests were conducted at the level of  $\alpha = .05$ .

### *• Vocabulary test.*

A *t*-test was conducted on the vocabulary test, and no significant difference was found between the two groups,  $t(1, 54) = 0.06$ ,  $p > .05$ . Tests confirmed that the students' vocabulary for the text material did not differ

between the two groups.

• *Sentence verification task.*

A  $t$ -test was conducted on the scores of the sentence verification task, and no significant difference was found between the two groups,  $t(1, 54) = 0.62$ ,  $p > .05$ . Tests confirmed that the students' text comprehension at the level of the *propositional textbase* did not differ between the two groups.

• *Inference task.*

A  $t$ -test was conducted on the scores of the inference task, and no significant difference was found between the two groups,  $t(1, 54) = 0.08$ ,  $p > .05$ . Tests confirmed that the students' text comprehension at the level of the *situation model* did not differ between the two groups.

Table 1

*Means and Standard Deviations of Scores by Groups on the Three Tests*

Test	Group	
	Sight Words	Control
Vocabulary		
<i>M</i> (out of 208)	202.03	201.92
<i>SD</i>	6.94	6.86
Sentence Verification		
<i>M</i> (out of 4)	2.86	2.87
<i>SD</i>	0.28	0.27
Inference		
<i>M</i> (out of 6)	2.24	2.27
<i>SD</i>	1.28	1.09

*Note.* *M* represents means and *SD* represents standard deviation. For all tests,  $n = 55$ .

## Discussion

This study primarily aimed to examine whether or not our instructional CDs are actually effective or not. With regard to this research question, the experiment results failed to reveal any advantages of studying with our instructional CDs over studying without our instructional CDs and without any time constraint per word. The students who studied using our instructional CDs did not outperform those who were not provided with it in the memorizing task. This shows that the mental representation of English words in both two groups does not differ from each other, regardless of the different ways to memorize English words.

In addition, this study also aimed to investigate whether or not the experimental group will construct a better *textbase* and *situation model* for a given text than the control group as the instant linkage among the words used in a text is critical for a better construction of both mental representations of a given discourse. As regards this research question, the results gained from this experiment indicate that the performance of both groups on the two different tasks did not differ from each other. However, this hypothesis can be confirmed on the condition that the experiment group outperforms the control group in the vocabulary task, but considering the result that the vocabulary task failed to differentiate the two groups, it cannot be judged whether or not the students who have enough sight vocabulary will construct a better *textbase* or *situation model* for a given text than those who are not due to the instant linkage among the words used in a text.

In the future studies, we firstly have to develop a concrete instructional method to help students acquire sight vocabulary in their foreign or second languages, and then secondly to examine whether the sight vocabulary acquisition enhances students' comprehension of texts written in their foreign or second languages from the view of two different levels of discourse comprehensions, *textbase* and *situation model*.

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### **Appendix: used as a text material in this study**

Take a moment to imagine what the polar bear's environment is like. In winter, freezing temperatures prevail for months at a time, and snowstorms hinder vision. The sea ice is highly variable — frozen solid during cold, calm weather and broken up in large areas of open water during storms. The ice may drift considerable distances each day. Patterns of freeze-up and breakup influence the distribution and number of seals, the polar bear's main prey. The result is a continual search for food in a changing environment.

To survive, the polar bear must keep its body at the right temperature and store enough energy to last between meals that could be a few days or a few months apart. Its normal

temperature while resting is about  $37^{\circ}\text{C}$ , similar to that of humans and other mammals. A bear's fur, tough hide, and layer of fat, which can be eleven centimeters thick, provide such excellent insulation that the bear does not have to burn extra energy often to maintain the right body temperature, even when the surrounding temperature drops to  $-36^{\circ}\text{C}$ . As long as a bear is relatively inactive, and is not expected to wind, it does not burn excessive energy in cold weather.

The disadvantage of being so well insulated is that the bear overheats quickly. At temperatures ranging from about  $-20^{\circ}\text{C}$  to  $-24^{\circ}\text{C}$ , a polar bear's body temperature remains fairly constant at walking speeds of up to about four kilometers per hour. After that, internal temperature begins to climb rapidly. When the animal is walking only six and a half kilometers per hour, its temperature is almost  $37.7^{\circ}\text{C}$ , fever temperature in a human; to move even at this modest speed, a bear uses thirteen times as much energy as it would if it was lying down.

In fact, to move at any speed, the polar bear uses twice as much energy as do most other mammals. This inefficiency is a result of the animal's large body and massive legs and feet, which contribute a sideway motion to its walk. These special characteristics explain its preference for still-hunting (lying motionless beside a seals' breathing hole, waiting for one to surface; the polar bear mainly feeds on seals). This behavior is energy-efficient in an environment where calories can be hard to come by. When bears sleep or lie down, their postures depend on whether they want to get rid of heat or conserve it. On the open ice a bear may lie on its stomach. On warm days, bears stretch out or lie on their backs with their feet in the air. On colder days, they curl up or dig a pit in the snow.

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